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**[Finalised field protocol – field guidance (WP2 Task 4.1)]**

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## WP2 : CLIMATE –HYDROMORPHOLOGY INTERACTIONS

### Task 4.1 Paired studies of straight and braided channels: discharge – restoration of habitat diversity – indicators

*Interaction with Task/Subtask 1.1, 2.1, 2.2, 5*

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Overall aim: to compare straight (or modified) vs braiding (or restored) river stretches

#### **Habitat mapping approach – General statements**

- Habitat: a combination of the parameters: substrate – velocity - depth
- Transect approach <sup>[1, 2, 3]</sup>-, minimum of 10 transects per site
- Distance between transects to be defined according to stream size (5, 10, 25m) and type<sup>[1]</sup>, also considering habitat diversity (i.e. how large the invertebrate sampling stretch must be to be representative)
- Number of sites/stretch/samples for each Partner depends on PMs/money available

#### **Field Guidance**

##### **Recording of transect information**

###### **Instream (mainly aquatic)**

- Water width is measured (assessed)<sup>[4]</sup>
- Existing bars are measured as well and mapped (together with water width, they contribute to determine total “channel width”<sup>[4]</sup>)
- Mineral substrates (according to the AQEM/STAR list of substrates<sup>[5]</sup>; Annex I) are recorded along the transect
- Organic substrates (according to the AQEM/STAR list of substrates<sup>[5]</sup>; Annex I) are recorded along the transect
- If organic substrates e.g. CPOM or emergent macrophytes) are mixed/overlap with mineral substrates, both features should be indicated (e.g. MicroL/CPOM; Annex V)

- If organic substrates e.g. CPOM or emergent macrophytes cover entirely the mineral layer, only the upper (i.e. organic) habitat is recorded (the indication of the underlying mineral substrate is optional)
- The above mentioned substrate information, together with depth and velocity (at 0.6 depth), has to be recorded along the transect in line with:
  - a) a fixed number of measuring points, equally spaced across the transect (e.g. 20, UDE)<sup>[6]</sup>  
or
  - b) measures will be taken according to habitat discontinuity along the transect, i.e. at every major change in the combination of microhabitat/flow type (e.g. shift from MicroL-Rippled to MicroL-Unbroken Waves, shift from MicroL-Rippled to MesoL-Rippled), in the central portion of the identified cell (e.g. CNR)

Both approaches will allow to quantify the substrate and flow habitats occurring at the site.

### **Terrestrial, semi-aquatic**

- The extension of the bank-face (distance from in-channel bar/water outer limit and banktop) measured for both banks, by keeping e.g. the tape-meter parallel to the ground; bank-face vegetation cover (main categories) are assessed
- Bankfull width (distance from left to right banktop) is assessed (measured or estimated) for each transect<sup>[3]</sup>

### **Invertebrate sampling**

- Italian AQEM approach: each sample unit kept separate<sup>[3]</sup>, i.e. the collected samples are not merged into a “site sample”
- 20 sample units sampled according to the proportion of each substrate in the river stretch<sup>[5, 8]</sup> (in a stretch at least twice long the channel width). Integrative sample units can be sampled to cover substrates represented below 5% in the river stretch and whose informative potential is high<sup>[9, 10]</sup> (e.g. Submerged Macrophytes)
- Additionally, for a number of relevant habitats (e.g. 3-6 habitats, defined according to river features and existing knowledge), further replicates are collected, so that for each of those habitats at least 3 replicates are available for statistical comparison (the final number of samples per site might result in e.g. 25-30 samples) [→ link to Task 2.2]
- For each invertebrate sample the following information is recorded (e.g. Annex IV), samples accordingly labelled:
  - Mineral/Organic substrate (AQEM/STAR list<sup>[5, 8]</sup> / Annex I)
  - Depth
  - Velocity, at 0.6 depth (obligatory), at 0.2 depth and bottom (optional)
  - RHS flow type<sup>[10, 3]</sup> (optional)
- Mesh size (suggested<sup>[8]</sup>): 500 µm
- Sampling device: Surber, etc. (AQEM/STAR standards<sup>[8]</sup>)
- Description of sampling performances for different substrates are compiled in<sup>[12]</sup>

### **Invertebrate sorting/subsampling**

- Sorting can be performed accordingly to Partners’ expertise and stream type features e.g. dead or live sorting, in the lab or in the field, mixed procedures<sup>[8]</sup>.
- Sub-sampling is allowed<sup>[8]</sup>, which does not prevent functional analysis of the sample to be done afterwards (e.g. species level identification, identification check, quantitative estimation)

## Season

- One sampling season is considered acceptable
- If more than one habitat mapping and/or sampling dates are planned, preferably try to select 2 periods representing a before/after peak flow conditions [→ link to Task 3.1]

## Data recording, storage

### Field protocols

Annex I-IV

### Suggested data format / storage

Data might be organised in several tables;

UDE has designed a database, where data from sites, transects, points and sampling are linked (Annex V).

Transect and point data is coded the following way:

Transect section code								
gmb.1.01.a								
gmb	1	2	1	...	20	a	...	x
Stream	Character		Transect No			successive		
	straight	braided				stretches		

Point code								
gmb.1.01.01								
gmb	1	2	1	...	20	1	...	20
Stream	Character		Transect No			Point No		
	straight	braided				on each transect		

## Suggested steps for fieldwork

- Select appropriate field sites
- Determine length of sites to be compared, approximate mid-channel length is sufficient
- Determine distance between transects, if measurements are planned to be re-done, use marker to find them again
- Start with measuring width of aquatic – terrestrial – transient width
- Use this data to calculate distribution of points for habitat mapping in aquatic parts of transects
- Record substrate – depth – velocity and further information; if estimation of the coverage of habitats needs to be corrected, e.g. due to hardly visible parts of the river bed, this can be done during the sampling procedure. After sampling, the estimated coverage of substrates should be reviewed for accuracy and completeness<sup>[12]</sup>
- Use substrate data to calculate substrate portions and plan accordingly for macro-invertebrate sampling, e.g. number of containers, prepare labels, alcohol, car size
- Further steps include sorting, sub-sampling, identification and data handling according to partners expertise and stream type features (see above)

## References

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## Annex

**Annex I: Table substrates**

**Annex II: Table standard terms for transect data**

**Annex III a,b: Suggested field protocol front / back page (UDE)**

**Annex IV: Suggested field protocol for invertebrate sampling: 'Bio-Limpacs' (CNR)**

**Annex V: Structure database (UDE)**

**Annex I: Table substrates**

<b>Substrate</b>	<b>Abbr.</b>	<b>Type</b>	<b>Grainsize (mm)</b>
<b>Macro-/Megalithal</b>	<b>macro</b>	Mineralic	> 200
<b>Mesolithal</b>	<b>meso</b>	Mineralic	> 60 - 200
<b>Microlithal</b>	<b>micro</b>	Mineralic	> 20 - 60
<b>Akal</b>	<b>ak</b>	Mineralic	> 2 - 20
<b>Psammal</b>	<b>psam</b>	Mineralic	> 0,006 - 2
<b>Argyllal</b>	<b>ar</b>	Mineralic	< 0,006
<b>Lithal*</b>	<b>li</b>	Mineralic	
<b>Algae</b>	<b>al</b>	Biotic	
<b>Submergent macrophytes</b>	<b>sm</b>	Biotic	
<b>Emergent macrophytes</b>	<b>em</b>	Biotic	
<b>Living parts of terrestrial plants</b>	<b>lptp</b>	Biotic	
<b>Xylal (LWD)</b>	<b>xylal</b>	Biotic	
<b>CPOM</b>	<b>cpom</b>	Biotic	
<b>Sewage bacteria and - fungi and saprobel</b>	<b>bact</b>	Biotic	
<b>Organic mud (pp)</b>	<b>pp</b>	Biotic	

\* not preferable to use, only e.g. when visibility is limited

**Annex II: Table standard terms transect**

<b>Habitat type</b>	<b>Abbr.</b>
Aquatic	A
Semiaquatic/Transient	S
Terrestrial	T

<b>Channel elements</b>	<b>Abbr.</b>
Main channel	MC
Secondary channel	SC
Connected sidearm	Con
Disconnected sidearm	Dis
Temporary standing waterbody	Temp
Permanent standing waterbody	Perm
Bank	Bank
Sidebar	Sideb
Midchannelbar	Midb
Island (vegetated)	Isl
Embankment	Emb
Floodplain area	FP

<b>Gradient bankprofile</b>	<b>Abbr.</b>
+Flat <5	G0
<Steep 5-45	G1
>Steep 45-90	G2
Undercut >90	G3
Erosion visible?	
Terrassed	GT

<b>Cover type</b>	<b>Abbr.</b>
Overflown (hygropetric)	HY
Woody riparian vegetation (% cover)	WRV
Herbacious vegetation (% cover)	HV
Wetland	Wet
Bare	Bare
Technical Substrate	T

<b>Shading (% of bed)</b>	<b>Abbr.</b>
<25	S1
25-50	S2
50-75	S3
>75	S4



**Annex III a,b: Suggested field protocol front / back page (UDE)**

**[next 2 pages]**





**BIO-LIMPACS INVERTEBRATE SAMPLING FORM**

RIVER \_\_\_\_\_

SITE \_\_\_\_\_

DATE \_\_\_\_\_

	Italian AQEM sample code	Bio-Limpacs sample code	CHANNEL					BANK/CHANNEL Depositional feature			BANK Erosional feature		Sample characteristic			
			n. active channels	Channel number (*2)	Water width at sample location (m)	I-II	Left-Center-Right LCR	Distance from left bank/bar (m)	Bank Depositional (*3)	Channel Depositional (*4)	Distance from the bank (m)	Bank Erosional (*5)	Water velocity (cm/sec) (*8)	Water depth (cm)	Flow Type (*6)	Functional Habitat (*7)
Mesolitoral (6-20 cm)	R 1-10; P 11-20	bR/P30-														
Mesolitoral (6-20 cm)		Me1														
Mesolitoral (6-20 cm)		Me2														
Mesolitoral (6-20 cm)		Me3														
Macrolitoral (20-40 cm)		Ma1														
Macrolitoral (20-40 cm)		Ma2														
Macrolitoral (20-40 cm)		Ma3														
CPOM		CP1														
CPOM		CP2														
CPOM		CP3														
Psammal		SA1														
Psammal		SA2														
Psammal		SA3														
*		1														
*		2														
*		3														
		1														
		2														
		3														

(\*1) The expert has to decide if to sample TP or not (according to its availability and relevancy at the site)

(\*2) Channel 1,2,3,4...n. Channel number assigned facing downstream, from left bank.

(\*7) Functional habitat: Pool, Riffle, Run-Riffle, Transitional, Bedrock (optional).

(\*8) Water velocity measured at 0.6 depth: obligatory. At 0.2 depth and bottom: optional.

## Annex V: Structure database (UDE)

